

July 2015 Regional Climate Summary

For the San Francisco Bay Area and Monterey Bay Area

July 2015 was a warm month, especially near the coast. **Average July temperatures at eight coastal climate stations were the warmest on record.** Three heat events during the month helped elevated average monthly temperatures into record territory. Also contributing to the record warm monthly average temperatures, especially at night and in coastal areas, were warmer-than-normal sea surface temperatures along the California coast.

Subtropical moisture flowed across the region periodically in July and generated isolated thunderstorms on four July days (July 2, 9, 19 and 31). The most widespread and significant thunderstorm activity occurred over Monterey county on July 19 when moisture from former hurricane Dolores flowed northward across southern and central California.

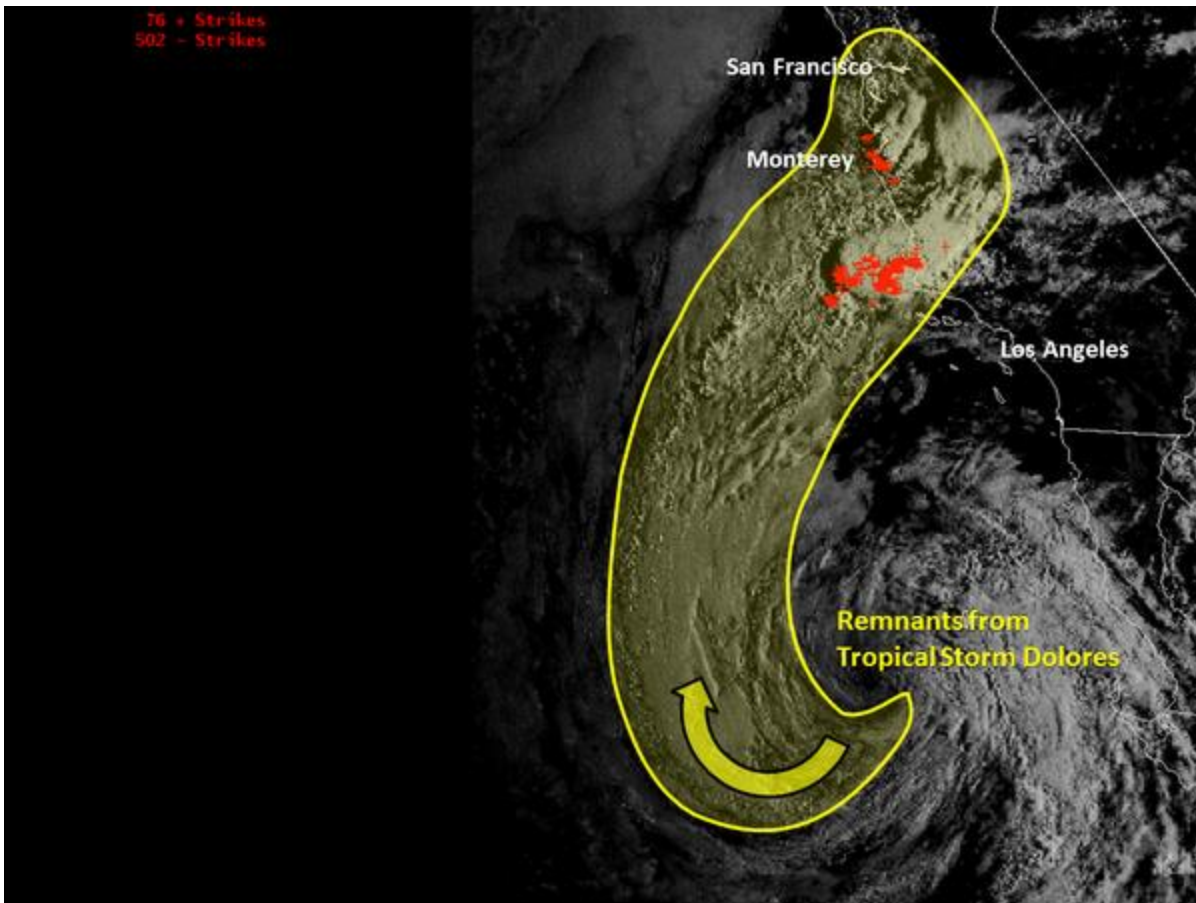
Strong high pressure dominated much of the western United States at the beginning of July. July 1 started out very warm, especially in the hills. 6 am temperatures in the hills that morning included 85 degrees at Altamont, 80 in Ben Lomond and 83 at Mount Tamalpais. Afternoon temperatures topped out at 105 at the Livermore Airport and 102 in Morgan Hill. However, no record high temperatures were set on the 1st.

Southeasterly flow aloft at the start of the month allowed monsoon moisture to flow north and west across California. Scattered thunderstorms erupted over the Central Valley east of the Diablo Range shortly after midnight on July 2. An isolated thunderstorm developed over the East Bay early that morning and by 5 am scattered showers were occurring across the North Bay with a few reports of lightning.

Typical northwest winds over the coastal waters eased in early July. The result was diminished upwelling along the California coast and warming sea surface temperatures. By July 5 the water temperature at Monterey Bay Buoy had reached 64 degrees and by July 12 the water temperature had peaked at 67 degrees, only one degree shy of the record warm water temperature set last July. The average water temperature at the Monterey Bay Buoy during the month of July is in the mid to upper 50s.

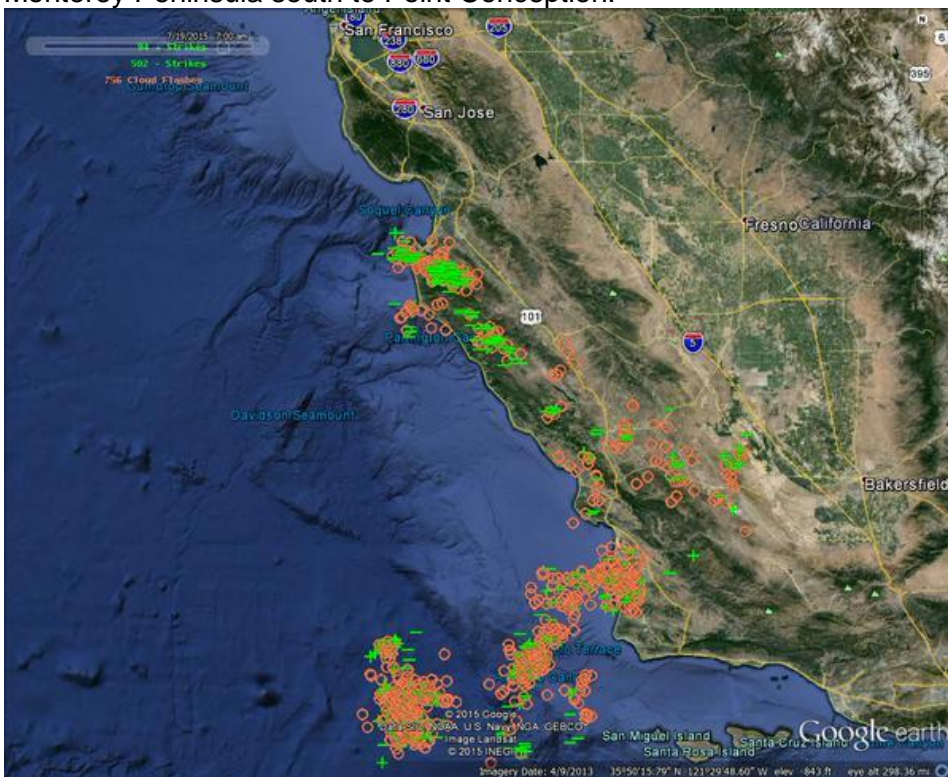
A weak upper low that had resided offshore during the early part of July, and which helped draw monsoon moisture north and west into our area, finally moved slowly inland across California from July 8 through 10. Isolated showers occurred across portions of the area on all three days, but were most widespread on the 9th. Scattered thunderstorms also occurred during the morning of July 9 along the San Benito/Fresno county line where 200 lightning strikes were detected.

In mid-July hurricane Dolores developed off the west coast of Mexico. Dolores then drifted slowly north and weakened. By July 18, remnants of Dolores arrived off the coast of southern California, and moisture from Dolores had spread well north of the former tropical system. By the evening of Saturday, July 18, an isolated thunderstorm developed over southeast San Benito County. Dolores moisture made its way as far north as the eastern San Francisco Bay Area that night, and isolated showers developed over Contra Costa County shortly after midnight on Sunday, July 19. But it wasn't until about sunrise on July 19 when the bulk of the convective precipitation developed. By 6 am thunderstorms had developed across western Monterey County. By 6:20 am that morning, more than 60 lightning strikes had been detected in and around Carmel and Carmel Valley. And, significant thunderstorm activity was occurring south through San Luis Obispo County and Santa Barbara County, and also offshore of Point Conception.

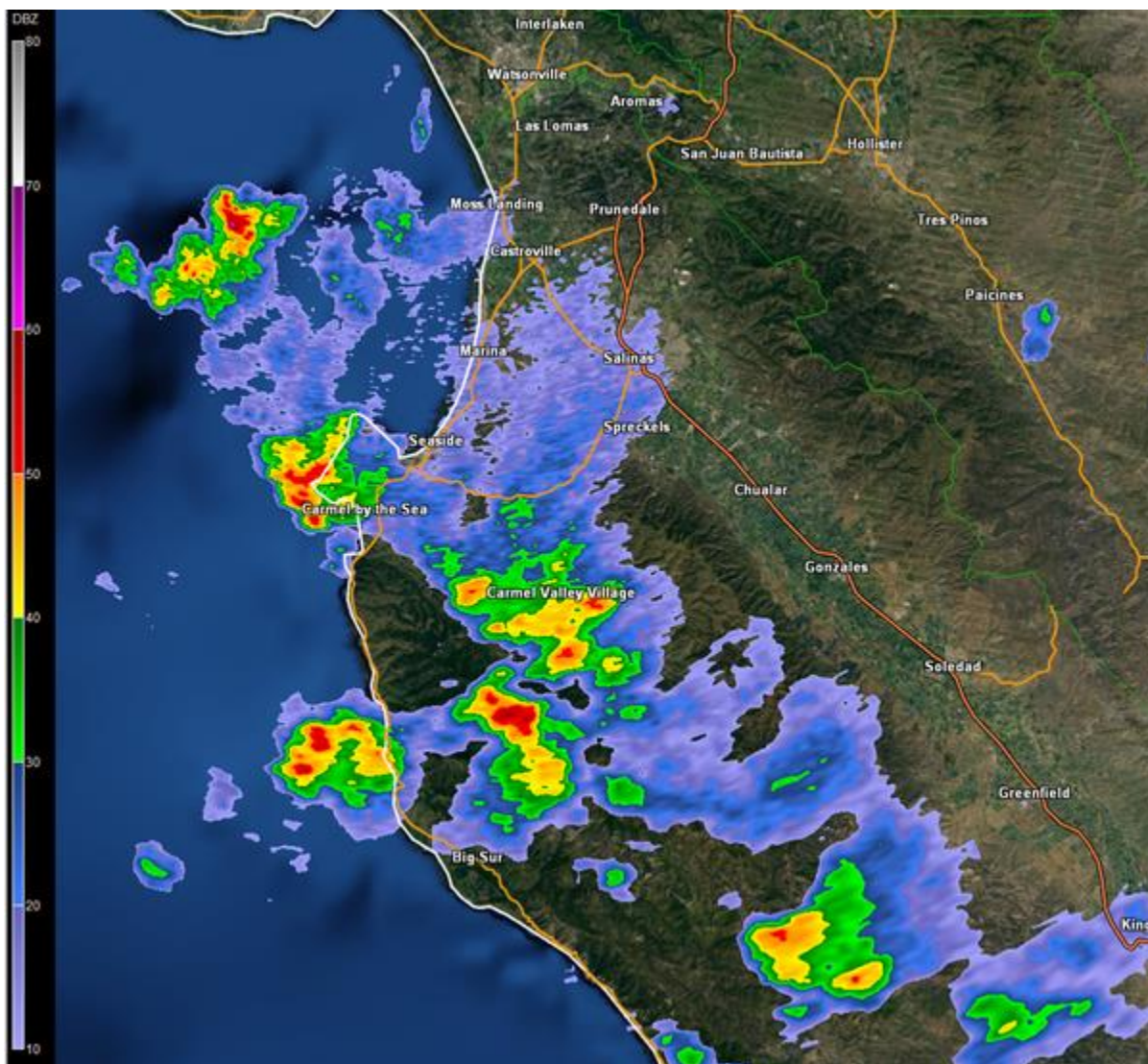


Social media graphic from the morning of July 19, illustrating the remnants of former Hurricane Dolores and its associated moisture plume that resulted in thunderstorm activity across the Central California Coast.

Between 6 and 7 am that morning almost 600 cloud-to-ground lightning strikes had been detected from the Monterey Peninsula south to Point Conception.



Graphic depicting lightning strikes between 6 and 7 am on Sunday, July 19.



Radar image of northern Monterey County at 7:10 am on Sunday, July 19, showing scattered thunderstorms over Monterey Bay, the Monterey Peninsula, Carmel Valley, and Big Sur.

Rainfall with these thunderstorms was locally heavy. Carmel-by-the-Sea picked up a half inch of rain and Carmel Valley Village accumulated nearly an inch. The average rainfall for the entire month of July in Carmel Valley is only one one-hundredth of an inch.

Some photos of lightning across northern Monterey county from the morning of July 19:



***Photo taken from Moss Landing, looking south at a lightning strike near the Monterey Peninsula.
Photo: Vern Fisher***



Lightning over northern Monterey County near Carmel Valley (Cachagua). Photo: Kathy O'Connell

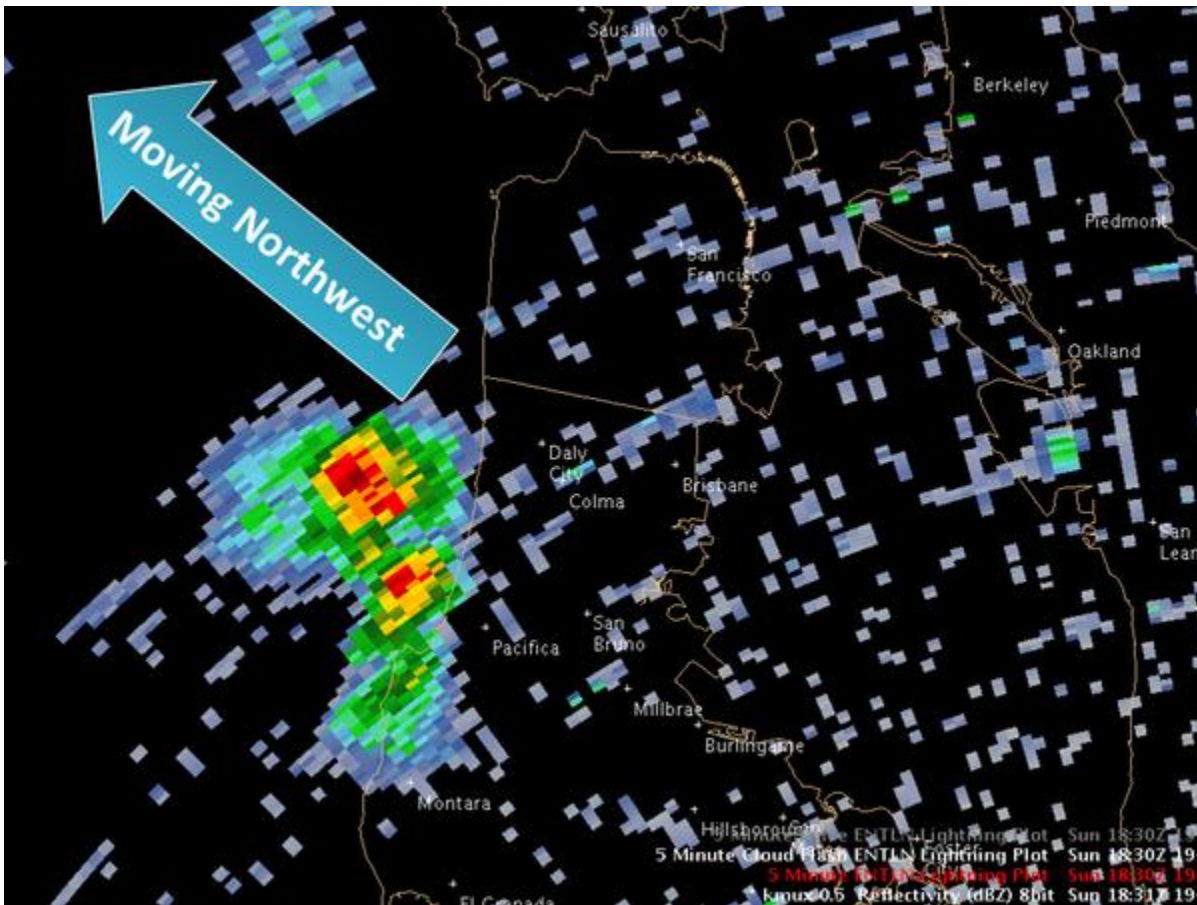


July 19 lightning near Monterey. Photo: Ryan Smithies



July 19 lightning near Pebble Beach. Photo: Ryan Smithies

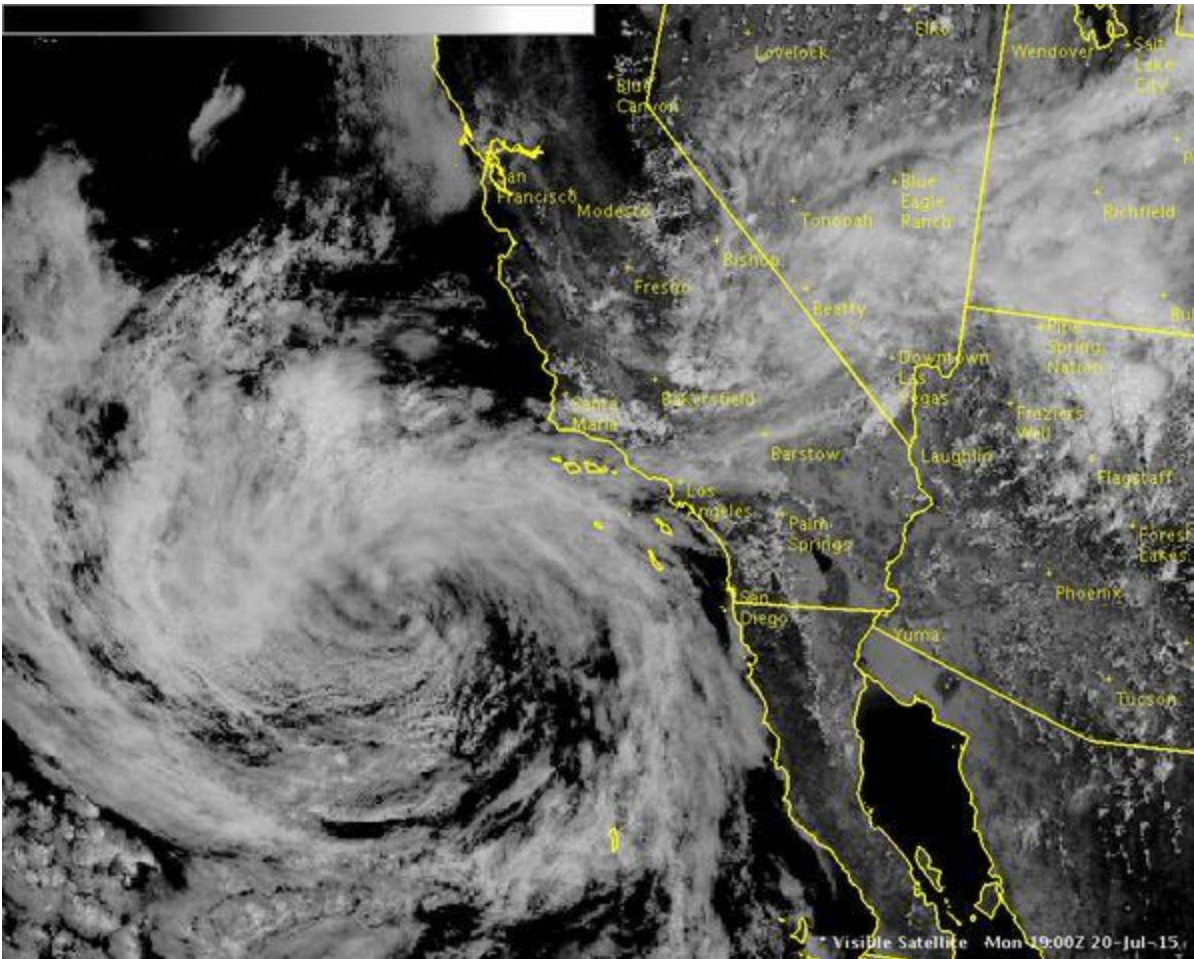
By 10 am on the morning of July 19, most thunderstorm activity had shifted west off the Monterey County coast. But by late that morning an isolated thunderstorm narrowly missed San Francisco to the southwest.



Radar image at 11:30 am on the morning of July 19, showing a thunderstorm off the northern San Mateo County coast.

By early afternoon on July 19 renewed shower activity over San Luis Obispo County moved northward into southern Monterey County. Widespread clouds covered much of Monterey County, including Pinnacles National Park. At 2 pm that afternoon the temperature at Pinnacles National Park was only 72 degrees. Meanwhile, farther north where skies remained mostly sunny, temperatures warmed into record territory. The 2 pm temperature in downtown San Francisco was a toasty 85 degrees (a record high). It's exceedingly rare for San Francisco to be 13 degrees warmer than Pinnacles during a summer afternoon. In addition to Downtown San Francisco, four other climate sites set new record highs on July 19. The warm airmass remained over the area into the 20th when four more record high temperatures were set, mainly near Monterey Bay.

By Monday, July 20, most moisture from Dolores had moved out of the San Francisco and Monterey Bay areas, but the circulation center of the former hurricane could still be seen on satellite off the southern California coast.



Visible satellite image taken at noon on Monday, July 20, showing the circulation center of former Hurricane Dolores off the southern California coast.

On Wednesday, July 22, a 1000 acre wildfire burned across extreme eastern Napa County. This wildfire, called the “Wragg Fire” burned nearly 7000 acres near Lake Berryessa by July 26.



Photo taken of the Wragg Fire in eastern Napa County. Photo: KTVU

High pressure strengthened over California once again late in the month and resulted in two more record highs on July 28. The heat late in the month was once again followed by a northwestward surge of monsoon moisture across California. Light rain began to fall over isolated portions of central Monterey county by late evening on July 30. Isolated showers advanced northward to Pebble Beach shortly after midnight on July 31, then developed around Salinas and Hollister by 7 am that morning. By late morning showers had developed in Santa Clara county and there were reports of thunder in San Jose. Around midday radar detected isolated showers and thunderstorms across Santa Cruz and Santa Clara counties. Small hail was reported in west San Jose.

July is typically the driest month of the year, when many climate stations have 30-year average rainfall amounts of zero. Thus, any rainfall in July results in very high “percent of normal” values. For instance, Carmel Valley’s 0.91” of rain on July 19 resulted in a July rainfall total that was 9100% of normal. Isolated convective precipitation during July resulted in several climate stations picking up measurable rain and thus rain totals that far exceeded monthly normals. However, due to the isolated nature of July’s precipitation, many climate stations received no measurable rain in July.

July Regional Precipitation Summary:

Location	July Rainfall	Normal July Rainfall	Percent of Normal
North Bay			
Angwin	0.05	0.01	500
Calistoga	0.11	0.03	367
Cloverdale	0.16	0.01	1600
Kentfield	0.08	0.00	n/a
Napa	0.01	0.00	n/a
Napa Airport	0.03	0.00	n/a
Occidental	0.11	0.01	1100
Petaluma Airport	0.06	0.01	600
Saint Helena	0.06	0.00	n/a
San Rafael	0.04	0.00	n/a
Sonoma County Airport	0.05	0.01	500
San Francisco Peninsula			
Half Moon Bay	0.05	0.14	36
Redwood City	0.00	0.00	n/a
San Francisco Airport	0.00	0.00	n/a
San Francisco Downtown	0.09	0.00	n/a
East Bay			
Antioch	0.00	0.00	n/a
Concord Airport	0.00	0.00	n/a
Fremont	0.00	0.00	n/a
Hayward Airport	0.01	0.00	n/a
Livermore	0.00	0.00	n/a
Livermore Airport	0.00	0.00	n/a
Mount Diablo Junction	0.05	0.01	500
Newark	0.00	0.00	n/a
Oakland	0.06	0.00	n/a
Oakland Airport	0.01	0.01	100
Richmond	0.00	0.00	n/a

South Bay & Santa Cruz County	July Rainfall	Normal July Rainfall	Percent of Normal
Ben Lomond	0.00	0.01	0
Gilroy	0.00	0.01	0
Moffett Federal Airfield	0.00	0.02	0
Mount Hamilton	0.00	0.01	0
San Jose	0.00	0.02	0
Santa Cruz	0.03	0.01	300
Watsonville	0.05	0.01	500
Watsonville Airport	0.05	0.02	250
Monterey and San Benito Counties			
Big Sur Station	0.07	0.03	233
Carmel Valley	0.91	0.01	9100
Hollister	0.00	0.00	n/a
King City	0.16	0.01	1600
Monterey	0.11	0.05	220
Monterey Airport	0.12	0.01	1200
Salinas	0.07	0.00	n/a
Salinas Airport	0.01	0.00	n/a

July Temperatures

Average high temperatures for July were above normal at coastal locations. In a few cases (Half Moon Bay, Monterey Airport, and Santa Cruz) average highs were warmer than normal by a significant amount (5 to 6 degrees warmer than normal). Average highs for inland areas were generally close to normal, either slightly warmer or slightly cooler than normal. Average low temperatures were almost universally warmer than normal, but particularly so near the coast. Average July low temperatures at 16 climate stations were the warmest ever recorded, including at the following locations:

Half Moon Bay
Hollister
King City
Monterey
Napa
Oakland Airport
Petaluma
Richmond
Saint Helena
Salinas
Salinas Airport
San Francisco Airport
San Rafael
Santa Cruz
Sonoma
Watsonville

One contributing factor for the record-breaking average minimum temperatures for July was undoubtedly the warmer-than-normal sea surface temperatures in the coastal waters. Another likely factor was the periodic subtropical moisture intrusions across California. The increased moisture content in the atmosphere reduced outgoing longwave radiation on several July nights, helping to hold nighttime temperatures up.

Average high temperatures for July were not record-breaking, although Santa Cruz came close. The average July high temperature of 81.3 degrees in Santa Cruz was the second warmest on record. Only July of 1947 was warmer.

Average monthly temperatures take into account both high and low temperatures and give a better picture of the overall warmth or coolness of any particular month. July's average temperatures were the warmest on record at eight climate stations in the San Francisco and Monterey Bay Areas. Each of these eight climate stations are in close proximity to the coast.

Average July Temperatures: Warmest on Record

Location	Average July 2015 Temperature*	Previous Record Warm July Temperature and Year
Half Moon Bay	63.6	62.3 in 2014
Monterey	63.7 (tie)	63.7 in 1995
Oakland Airport	67.2	66.3 in 2014
Richmond	67.0	66.6 in 1980
Salinas	66.6	66.4 in 1995
Salinas Airport	66.4	66.3 in 1983
Santa Cruz	69.8	67.9 in 2014
Watsonville	67.4	65.8 in 1984

*Average Monthly Temperatures take into account both daytime highs and overnight lows.
Average July Temperature = (Average High Temperature + Average Low Temperature)/2

In addition, San Francisco Airport experienced its second warmest July on record (its warmest July was just last year). **Downtown San Francisco**, which has 141 years of temperatures records, experienced **its third warmest July**. Only in July 1992 and July 1995 were average monthly temperatures warmer in the City.

July Regional Temperature Summary

Location	Average High	Normal High	Departure from Normal	Average Low	Normal Low	Departure from Normal
North Bay						
Angwin	83.4	86.0	-2.6	55.4	55.0	0.4
Calistoga	88.3	91.4	-3.1	54.5	52.5	2.0
Cloverdale	93.0	92.9	0.1	57.6	55.6	2.0
Kentfield	84.0	82.7	1.3	56.8	53.0	3.8
Napa	84.1	82.9	1.2	58.5	55.1	3.4
Napa Airport	79.6	78.3	1.3	55.9	52.5	3.4
Petaluma	80.9	81.9	-1.0	56.4	52.3	4.1
Saint Helena	88.1	89.1	-1.0	59.1	55.0	4.1
San Rafael	81.9	79.6	2.3	58.3	54.9	3.4
Sonoma County Airport	82.9	83.1	-0.2	55.4	51.9	3.5
Sonoma	86.5	87.2	-0.7	56.6	52.8	3.8
San Francisco Peninsula						
Half Moon Bay	70.5	65.0	5.5	56.7	51.6	5.1
Redwood City	81.5	82.0	-0.5	59.6	56.1	3.5
San Francisco Airport	74.0	72.0	2.0	59.3	55.4	3.9
San Francisco Downtown	69.1	66.5	2.6	58.8	54.1	4.7

East Bay	Average High	Normal High	Departure from Normal	Average Low	Normal Low	Departure from Normal
Antioch	89.8	91.4	-1.6	62.4	59.3	3.1
Concord Airport	87.3	87.0	0.3	61.8	57.7	4.1
Fremont	78.8	78.1	0.7	60.2	56.6	3.6
Hayward Airport	75.5	73.0	2.5	60.8	57.4	3.4
Livermore	87.6	88.9	-1.3	59.4	56.8	2.6
Livermore Airport	88.7	87.5	1.2	62.4	57.2	5.2
Mount Diablo Junction	80.3	84.7	-4.4	61.6	60.3	1.3
Newark	78.5	77.1	1.4	61.5	57.8	3.7
Oakland	74.1	72.0	2.1	60.2	56.2	4.0
Oakland Airport	74.3	70.3	4.0	60.0	55.5	4.5
Richmond	75.0	70.9	4.1	58.9	55.5	3.4
South Bay and Santa Cruz County						
Gilroy	87.1	88.2	-1.1	54.0	54.5	-0.5
Moffett Federal Airfield	78.4	77.1	1.3	61.0	59.1	1.9
Mount Hamilton	76.3	77.8	-1.5	61.9	64.6	-2.7
San Jose	79.9	81.9	-2.0	60.5	58.1	2.4
Santa Cruz	81.3	75.3	6.0	58.2	54.0	4.2
Watsonville	75.3	71.6	3.7	59.5	53.7	5.8
Watsonville Airport	75.0	73.2	1.8	57.4	53.1	4.3
Monterey and San Benito Counties						
Carmel Valley	79.4	78.7	0.7	54.5	50.2	4.3
Hollister	80.6	81.0	-0.4	57.3	53.0	4.3
King City	86.3	85.4	0.9	56.3	53.1	3.2
Monterey	70.7	66.3	4.4	56.6	52.2	4.4
Monterey Airport	72.3	67.2	5.1	58.7	53.6	5.1
Salinas	75.3	71.0	4.3	57.9	53.3	4.6
Salinas Airport	73.7	71.0	2.7	59.1	55.1	4.0

Daily High Temperature Records for July 2015			
Date	Location	Record Max Temp	Previous Record and Year
7/19	San Francisco Downtown	86	82 in 1996
7/19	Oakland Museum	97	85 in 1971
7/19	Richmond	85	85 in 1998
7/19	Salinas Airport	83	81 in 1988
7/20	Richmond	90	88 in 1996
7/20	Monterey	85	84 in 1996
7/20	Salinas	90	86 in 1996
7/20	Salinas Airport	89	88 in 1996
7/20	Santa Cruz	95	94 in 1996
7/24	Santa Cruz	90	89 in 1994
7/28	Oakland Museum	85	76 in 1977
7/28	Kentfield	98	98 in 1934

Daily Warm Low Temperature Records for July 2015			
Date	Location	Record Max Temp	Previous Record and Year
7/13	San Francisco Downtown	61	60 in 1992
7/20	San Francisco Downtown	62	62 in 1992

Miscellaneous July Climate Information

Monthly Ranks for Downtown San Francisco		
Average High Temperature	69.1 deg	13 th warmest July out of 141 years
Average Low Temperature	58.8 deg	Warmest July out of 141 years
Average Temperature	64.0 deg	3rd warmest July out of 141 years
Precipitation	0.09 in	7 th wettest July out of 166 years

Monthly Extremes for Select Locations			
Location	Max Temp: Warmest Day(s)	Min Temp: Coolest Day(s)	Precipitation: Wettest Day(s)
Sonoma County Airport	7/28	7/24	7/09
	100 degrees	48 degrees	0.05 inches
San Francisco	7/19	7/01	7/09
	86 degrees	55 degrees	0.07 inches
Livermore Airport	7/29	7/24	n/a
	107 degrees	57 degrees	
San Jose	7/28	7/24	n/a
	94 degrees	55 degrees	
Salinas Airport	7/20	7/01, 7/28	7/09
	89 degrees	54 degrees	0.01 inches

Note: This climatological data is preliminary. For official certified climatological data please contact the National Climatic Data Center at 828-271-4800 or <http://www.ncdc.noaa.gov>. Official values as determined at the above web site may take several months for authentication and publication.